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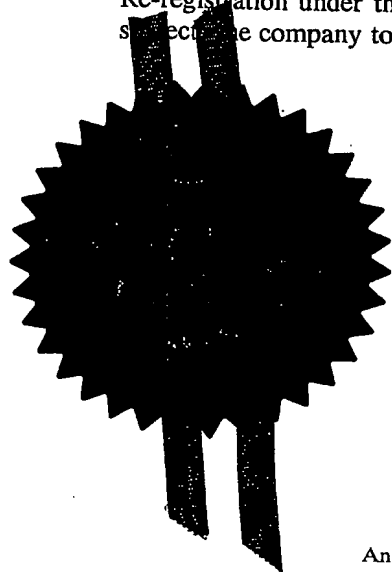
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13NOV01 E674077-1 C61838  
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1. Your reference

FB5344

2. Patent application number

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13 NOV 2001

3. Full name, address and postcode of the or of each applicant (underline all surnames)

Roger MCMORROW  
148 Finaghy Road South  
Belfast  
BT10 0DG  
Northern Ireland  
United Kingdom

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention A laryngoscope

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

9 University Street  
Belfast  
BT7 1FY  
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United Kingdom

Patents ADP number (if you know it)

7774417001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country  
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Priority application number  
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Date of filing  
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7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

N/A

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8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

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- a) any applicant named in part 3 is not an inventor, or
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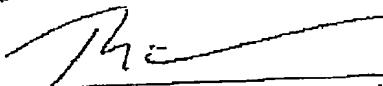
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Request for substantive examination (Patents Form 10/77)	0
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11.



I/We request the grant of a patent on the basis of this application.

Signature  
ROGER MCMORROW

Date  
1.10.01

12. Name and daytime telephone number of person to contact in the United Kingdom

Brian O'Neill - 028 9023 6000

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## A LARYNGOSCOPE

The present invention concerns a laryngoscope, and in particular a laryngoscope which includes a mirror which  
5 can be deployed in order to aid in operations which utilise the laryngoscope.

Laryngoscopes are well known, the purpose of which is to hold a person's throat open so that the larynx may  
10 be visualised allowing the passage of an endotracheal tube to be inserted therein. In its basic form, a laryngoscope includes a handle with a slightly curved or straight plate extending at a right angle from the handle. In use, the plate is inserted into the  
15 patient's mouth until the tip of the plate is located at the base of the person's tongue. Normally the tip of the plate is positioned between the base of the person's tongue and the epiglottis such that, lifting the laryngoscope anteriorly, the tongue and epiglottis  
20 are moved allowing an anaesthetist to see down into the trachea for the purposes of inserting an endotracheal tube therein. The anaesthetist will generally look for the larynx (vocal cords) which gives an exact indication of the position in which to place the  
25 breathing tube.

However, it is not always possible to obtain a clear view of the larynx, as it is often partially or wholly obscured by the tongue and/or epiglottis. This  
30 difficulty may arise for a number of reasons. The most common reason for this is normal anatomical variation. Another reason results from the necessity to tilt the person's head back in order to provide a direct view

down into the larynx. If you cannot tilt the person's head, it is obviously more difficult to see the larynx, and such a situation may arise where the person has suspected neck injuries, or alternatively arthritis or  
5 the like.

One solution to alleviate this problem is known as the "McCoy" laryngoscope. This type of laryngoscope has a pivotable tip at the end of the plate, the tip being  
10 operable by a lever on the handle of the laryngoscope. The handle is depressed, causing the tip to pivot inwardly in order to pull the epiglottis away from the mouth of the larynx. This arrangement does help to alleviate the problem of the tongue and/or the  
15 epiglottis obscuring the larynx, although there are still significant difficulties in many cases.

It is therefore an object of the present invention to provide a laryngoscope which includes a mirror which  
20 may be deployed in order to permit a clearer view of a patient's larynx.

It is a further object of the present invention to provide a laryngoscope with a mirror which may be  
25 deployed from, and tilted relative to, a plate of the laryngoscope by a single operation.

The present invention therefore provides a laryngoscope comprising a handle, a mirror, a plate mounted to the  
30 handle, an arm assembly pivotably mounted to the plate, and a trigger in operative association with the arm assembly such that initial operation of the trigger causes the arm assembly to pivot about the plate such

as to deploy the mirror and further operation of the trigger causes the mirror to pivot relative to the arm assembly.

- 5 Preferably, the arm assembly comprises a deploying arm pivotally mounted to the plate, and a secondary arm mounted between the deploying arm and the mirror, initial operation of the trigger effecting movement of the deploying arm to raise the mirror, and further
- 10 operation of the trigger causing relative movement between the deploying arm and the secondary arm, said relative movement causing the mirror to pivot relative to the arm assembly.
- 15 Preferably, the trigger is a lever pivotally mounted to the plate, a tie extending between the lever and the arm assembly to effect operation of the arm assembly upon depression of the lever towards the handle of the laryngoscope.
- 20 Preferably, the tie is connected to the secondary arm, which is in turn connected to the deploying arm by means of a spring assembly which transfers the force applied, in use, by the tie, to the deploying arm in
- 25 order to cause the entire arm assembly to pivot relative to the plate until a shoulder of the deploying arm abuts the plate, wherein the resistance of the spring assembly is overcome in order to permit the secondary arm to move relative to the deploying arm
- 30 such as to cause the mirror to pivot relative to the arm assembly.

Preferably, the secondary arm includes a pin which is located in a slot in the deploying arm, the spring assembly acting on the pin in order to maintain the pin in a stationary position within the slot until the

- 5 shoulder abuts the plate, wherein the force applied to the secondary arm overcomes the force applied to the pin by the spring assembly, affecting movement of the pin within the slot, and consequently relative movement between the deploying arm and the secondary arm.

10

Preferably, the mirror is secured to a mounting bracket which is pivotally mounted to the deploying arm, and the secondary arm is connected to the mounting bracket eccentrically of the connection between the mounting  
15 bracket and the deploying arm, such that the relative movement between the deploying arm and the secondary arm causes the mirror to pivot relative to the arm assembly.

- 20 Preferably, the laryngoscope includes a nose pivotally mounted at a forward end of the plate, the nose being coupled to the trigger such that operation of the trigger effects pivoting of the nose relative to the plate.

25

Preferably, when not deployed, the mirror lies substantially flush with the plate and/or the nose.

- Preferably, the laryngoscope is provided with a light  
30 source such that, when deployed, the mirror is irradiated by the light source.

The present invention will now be described with reference to the accompanying drawings, in which:

- Figure 1 illustrates a perspective view of a laryngoscope according to the present invention, wherein a mirror is disposed substantially flush with a plate of the laryngoscope;
- Figure 2 illustrates a side elevation of the laryngoscope of Figure 1;
- Figure 3 illustrates an exploded perspective view of the laryngoscope;
- Figure 4 illustrates a side view of the laryngoscope with the mirror deployed and pivoted with respect to the plate;
- Figure 5 illustrates a side view of the laryngoscope similar to that shown in Figure 4, wherein the mirror is pivoted further with respect to the plate;
- Figure 6 illustrates a partial perspective view of a handle forming part of the laryngoscope of the present invention; and
- Figure 7 shows a partial perspective view of the plate of the laryngoscope, in particular showing a coupling which permits the plate to be secured to the handle.
- Referring now to the accompanying drawings, there is illustrated a laryngoscope, generally indicated as 10, which provides enhanced performance due to the particular configuration thereof. The laryngoscope 10 consists primarily of a plate 12 mounted to a handle 14, and a mirror 30 which may be deployed and pivoted relative to the plate 12, as will be described in detail hereinafter.



The plate 12 consists of a base 22 and a side wall 24 extending from one side of the base 22, both of which serve, in use, to permit the visualisation of the larynx for the purpose of, for example, the insertion of an endotracheal tube (not shown) into the larynx. The plate 12 is formed integrally with a mount 78 which permits the plate 12 to be releasably secured to the handle 14, by means of a corresponding coupling 70 located at the top of the handle 14. In order to enhance the operation of the laryngoscope 10, a light 36 projects from the side wall 24 at a forward position on the plate 12, the light 36 being arranged, in use, to irradiate the mirror 30 when deployed. As is generally known, the laryngoscope 10 is provided with a pair of batteries 90 in the handle 14, in order to supply power to the light 36, although any other suitable power source may be employed. The configuration and operation of the light 36 will be described in greater detail hereinafter.

In order to further enhance the operation of the laryngoscope 10, a nose 18 is pivotally mounted, via a link 20, to the plate 12. As is illustrated in Figures 4 and 5, during use, the nose 18 pivots downwardly in order to draw the epiglottis (not shown) away from the laryngeal inlet of the patient, such as to provide a clear view of the patient's larynx. In order to effect this pivoting motion, the laryngoscope 10 is provided with a lever 16 which is pivotally mounted to the side wall 24 of the plate 12. Referring in particular to Figure 2, it can be seen that the lever 16 is connected to a bushing 66, which in turn is seated on and rotatable about, a spring mechanism 68. The spring

mechanism 68 includes a coiled spring (not shown) located internally thereof, the coiled spring being secured to the bushing 66 such as to spring bias the lever 16 away from the handle 14. Projecting downwardly from the bushing 66 is a first lug 62, to which is mounted a rigid strut 60. The strut 60 extends outwardly along the plate 12, and is secured to the nose 18. Therefore, upon depression of the lever 16 inwardly towards the handle 14, the strut 60 will be forced outwardly along the plate 12, thereby causing the nose 18 to pivot downwardly with respect to the plate 12. Due to the spring biasing of the lever 16, upon release thereof, the lever 16 will be forced outwardly away from the handle 14, thus drawing the nose 18 back into alignment with the plate 12 as is shown in Figure 1.

As can also be seen from Figure 1, when the lever 16 is fully released, and the nose 18 is aligned with the plate 12, the mirror 30 is located substantially flush with the base 22 of the plate 12, with the reflective face of the mirror 30 in register with the base 22. This is in order to reduce the size of the plate 12 during insertion thereof into a patient's mouth/throat. It can be seen from Figure 1 and Figure 3 that the width of the base 22 is enlarged adjacent the mirror 30, and the nose 18 is of a similar width, such that the underside of the mirror 30 is fully occluded when lying flush with the base 22 and the nose 18. This is in order to prevent the mirror 30 from becoming smudged or otherwise obscured during insertion of the plate 12, which is likely to contact the patient's tongue during insertion. In addition, both the nose 18 and the base

22, along the enlarged section thereof, may be slightly downwardly recessed, by approximately the depth of the mirror 30, such that the mirror 30, when in the collapsed state, sits within said recess (not shown) such that the upper face of the mirror 30 lies flush with the upper face of the base 22.

However, once the plate 12 is inserted, it is necessary to deploy the mirror 30 in order to provide a clear view of the patient's larynx. A second lug 64 is thus provided on the bushing 66, from which extends a rigid tie 58 to an arm assembly consisting of a deploying arm 66 and a secondary arm 28. Specifically, the tie 58 passes through an access slot 41 in the side wall 24 of the plate 12, and is directly connected to the secondary arm 28. The secondary arm 28 is mounted to the deploying arm 26 by means of a main slot 42 and a main pin 44, and a guide slot 52 and a guide pin 54, such as to be capable of movement relative to the deploying arm 26. The deploying arm 26 is pivotally mounted to the side wall 24 via a first pivot 50, and carries a spring 46 secured to the deploying arm 26 by means of an anchor 48. The spring 46 engages and acts upon the main pin 44, such as to urge the main pin 44 against the end of the main slot 42 and maintain the main pin 44 in this position.

Therefore, initial depression of the lever 16 will draw the tie 58 rearwardly, thus drawing the secondary arm 28 rearwardly therewith. As the spring 46 acts to prevent relative movement between the secondary arm 28 and the deploying arm 26, the force applied to the secondary arm 28 by the tie 58 will cause the deploying

arm 26 to pivot about the first pivot 50, thus drawing the mirror 30 upwardly away from the base 22. However, as clearly illustrated in Figure 1, the deploying arm 26 is provided with a shoulder 34 which will, after  
5 limited rotation of the deploying arm 26, abut against the base 22. At this point, the deploying arm 26 cannot rotate any further, and thus further rearward movement of the tie 58, due to further depression of the lever 16, will overcome the force of the spring 46. Referring  
10 to Figure 4, the main pin 44 will thus begin to be drawn rearwardly within the main slot 42, against the action of the spring 46, resulting in relative movement between the deploying arm 26 and the secondary arm 28. The laryngoscope 10 is adapted to translate this  
15 relative movement into pivoting movement of the mirror 30 relative to the deploying arm 26, as is described hereinafter.

The mirror 30 is secured to a mounting bracket 32 which  
20 is pivotally mounted to the deploying arm 26 at a second pivot 55. The secondary arm 28 is secured to the mounting bracket 32 at a third pivot 56 which is eccentrically located relative to the second pivot 55, as is clearly illustrated in Figure 4 and Figure 5.  
25 Therefore, as the secondary arm 28 is drawn rearwardly with regard to the deploying arm 26, the mounting bracket 32 will be caused to pivot about the second pivot 55, thereby imparting a pivoting motion to the mirror 30. In Figure 4, the main pin 44 has been drawn  
30 partially back along the length of the main slot 42, thus pivoting the mirror 30 with regard to the deploying arm 26. In Figure 5, the lever 16 has been fully depressed, and consequently the main pin 44 has

been drawn fully back within the main slot 42, thereby fully pivoting the mirror 30 with regard to the deploying arm 26. It will be apparent that, as both the lever 16 and the main pin 44 are spring biased, release of the lever 16 will result in the mirror 30 pivoting back to its initial position, and subsequently pivoting of the deploying arm 26 and the secondary arm 28 back towards the base 22, such as to return the mirror 30 into register with the base 22. It will be readily apparent that the mounting bracket 32 could be formed integrally with the mirror 30, thereby obviating the need for the two components to be manufactured separately and subsequently secured together.

As the mounting bracket 32 projects, in use, below the plane of the mirror 30, the base 22 is provided with a recess 57 which bulges downwardly therefrom in order to house the lower portion of the mounting bracket 32 when the mirror 30 is folded flat against the base 22. Although a suitably shaped aperture (not shown) could have been provided in the base 22, the recess 57 ensures that, during insertion of the plate 12, the mirror 30 is not contacted with saliva or the like, which may subsequently obscure the view through the mirror 30. The recess 57 also surrounds the mounting bracket 32 to ensure that the patient's tongue is not in any way damaged during insertion of the plate 12.

Furthermore, as previously described with regard to the nose 18 and the base 22, the side wall 24 may be slightly laterally recessed along the length thereof adjacent the deploying arm 26 and the secondary arm 28, such that the outwardly facing surface of the deploying

arm 26 lies substantially flush with the remainder of the side wall 24. It will be appreciated that such an arrangement would provide a clearer view, in use, down the length of the plate 12.

5

As herein before described, the light 36 is arranged to irradiate the mirror 30 when deployed. The light 36 may be of any suitable form, for example an LED, a tungsten filament, or a fibre optic bundle. In order to supply the light 36 with power, a conduit 40 is connected to the light 36, and extends rearwardly to the coupling 70, as can be seen in Figure 2 and Figure 7. The coupling 70, in use, is connected to the handle 14 such as to enable the passage of current from the pair of batteries 90 in the handle 14 to the conduit 40, as follows.

The batteries 90 are inserted, by removal of a cap 88, into the handle 14. The couple 70 at the top of the handle 14, as shown in Figure 6, includes a first contact 86 projecting therefrom. When the mount 78 is secured to the coupling 70, the first contact 86 abuts a second contact 76, which is electrically connected to the conduit 40. In order to releasably secure the plate 12 to the handle 14, the coupling 70 includes a mouth 72 which engages a bar 80 of the mount 78. The coupling 70 further includes a number of conventional detent balls 74 which engage corresponding indents 84 in a pair of walls 82 of the mount 78. The coupling 70 may thus be clipped and unclipped to the mount 78, thereby supplying power to the light 36 when the handle 14 is secured to the plate 12.

It will be appreciated from the foregoing description that as the nose 18 and the mirror 30 are both operated directly from the lever 16, they operate

simultaneously. This is clearly desirable and advantageous, as pivoting of the nose 18 provides a clear view, via the deployed mirror 30, into the patient's throat, allowing improved visualisation of the larynx. In addition, only this single operation, namely depression of the lever 16, is required to both deploy the mirror 30 and subsequently pivot the mirror 30 back and forth. The configuration and operation of the laryngoscope 10 means that little if any concentration is required for the successful operation thereof, leaving the anaesthetist's second hand free to perform other tasks related to the procedure.

The present invention is not limited to the embodiment described herein, which may be amended or modified without departing from the scope of the present invention.

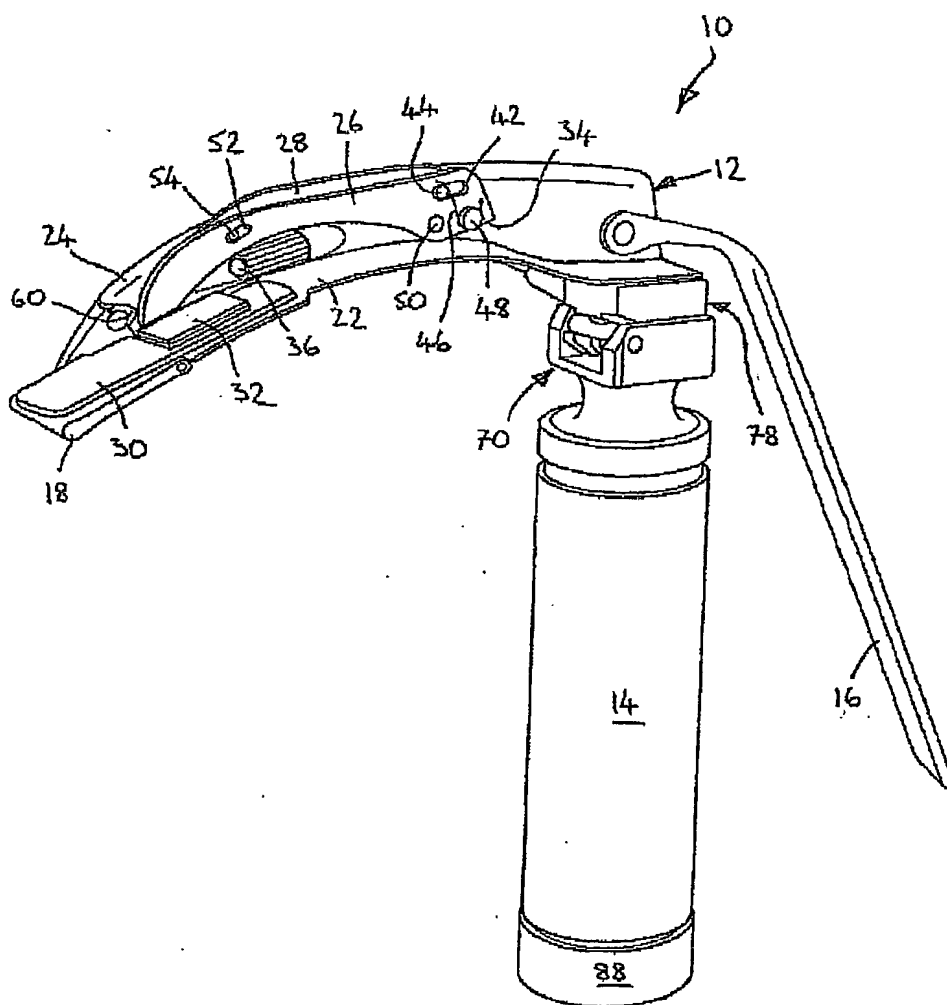


FIG. 1



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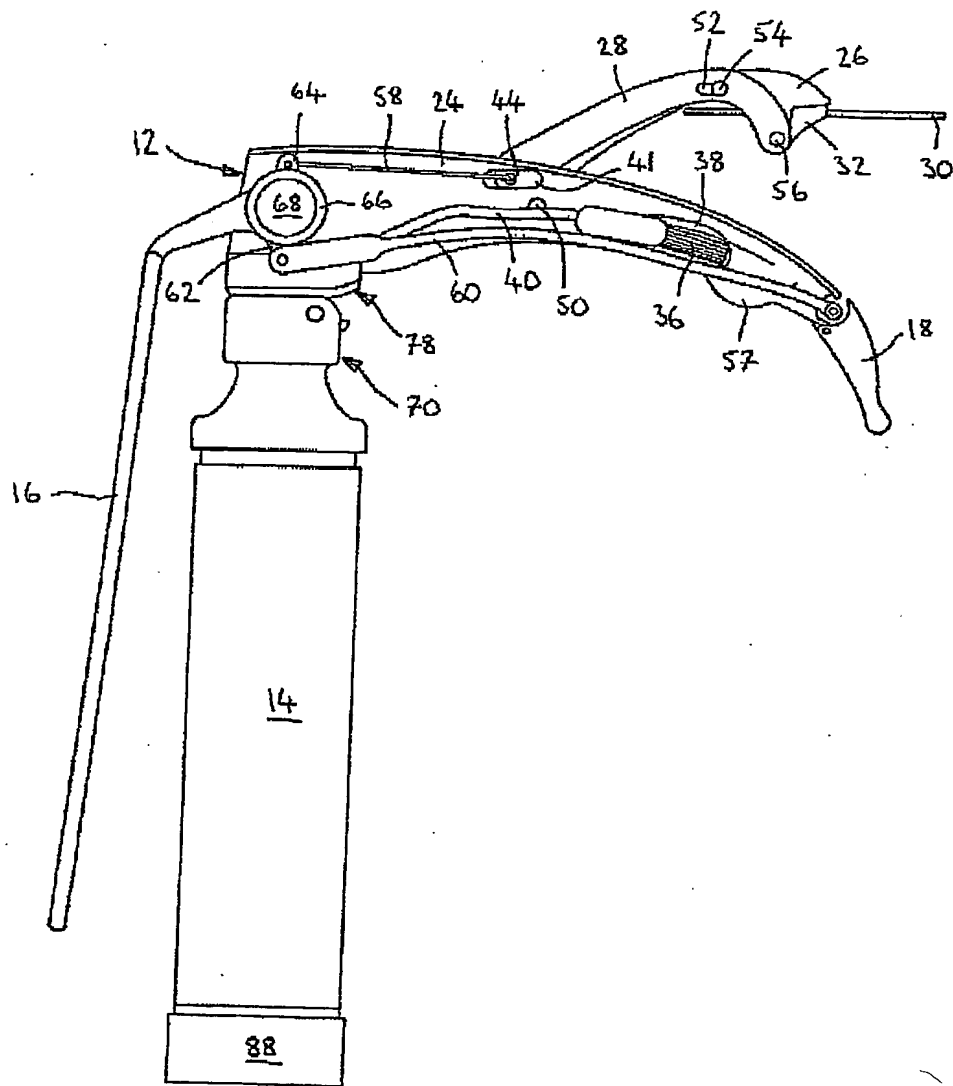


FIG. 2

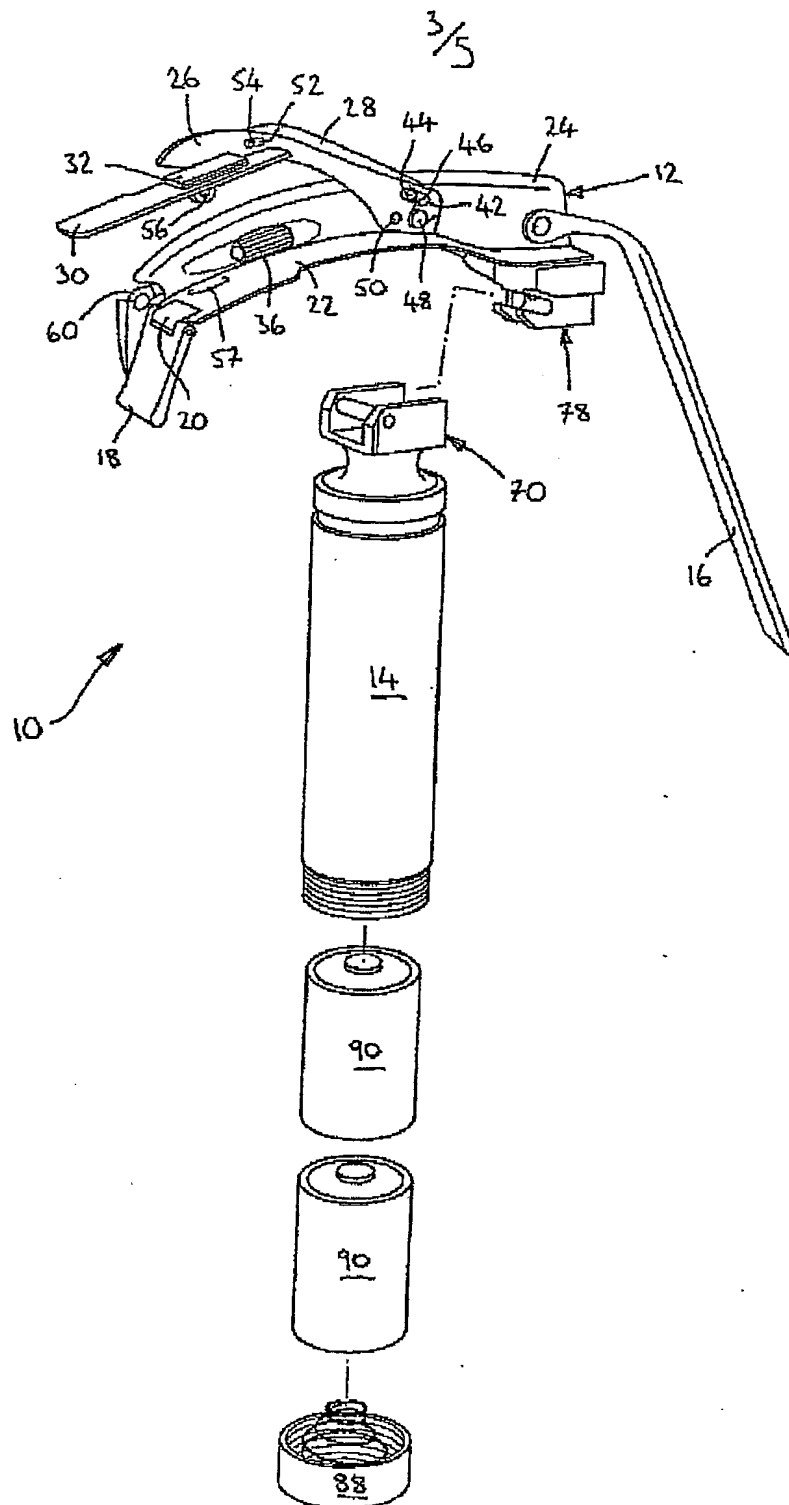


FIG. 3

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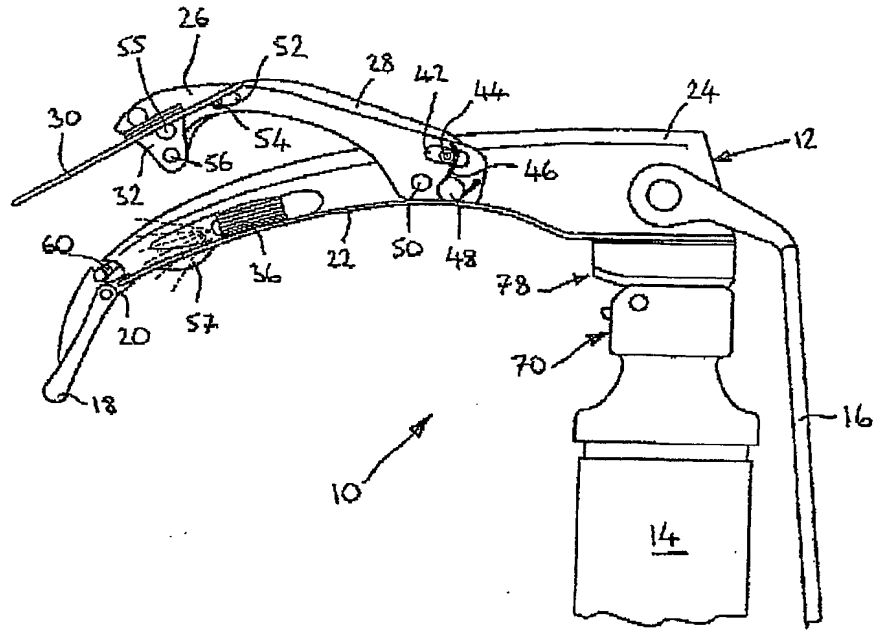


FIG. 4

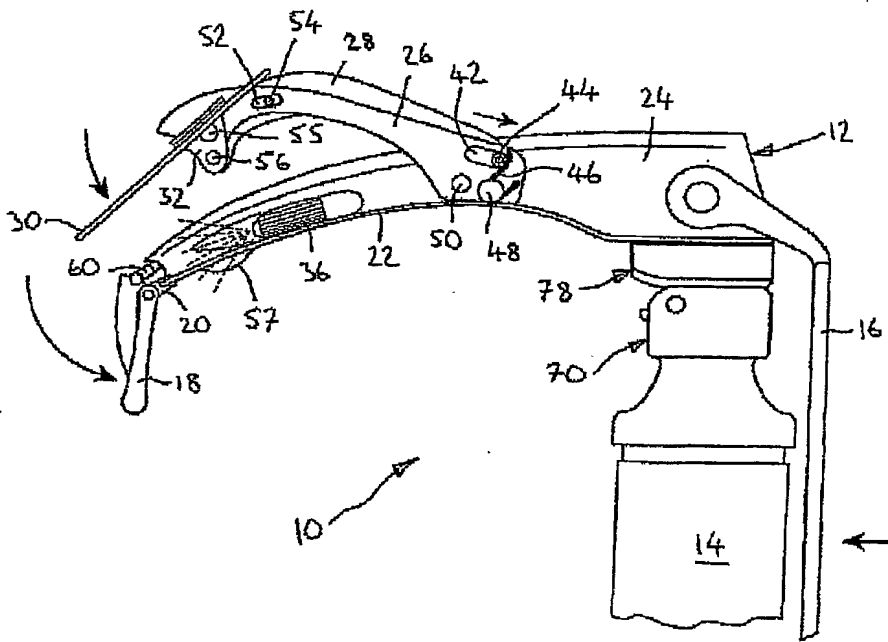


FIG. 5

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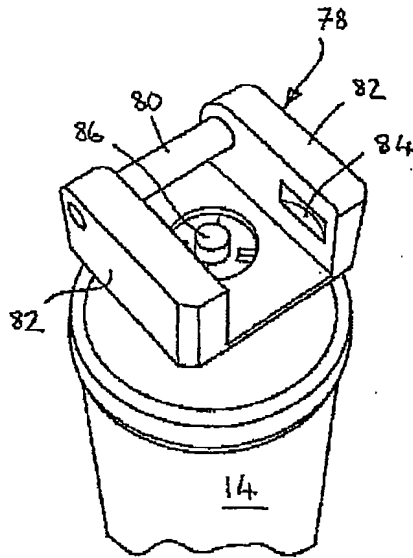


FIG. 6

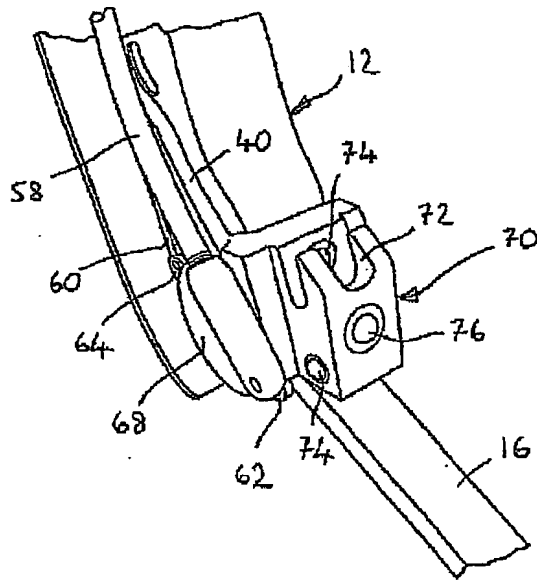


FIG. 7

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